BIG DATA ON TRIAL: RESEARCHING SYNTACTIC ALTERNATIONS IN GLOWBE AND ICE

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KU LEUVEN

OVERVIEW

1. Introduction
2. Data
3. Methodology
4. Results
5. Summary & Conclusion

INTRODUCTION

PROJECT

- "Exploring probabilistic grammar(s) in varieties of English around the world"
- 5-year project (2013–2018), KU Leuven
- Three alternations
  - Particle placement: Jason Grafmiller
  - Dative alternation: Melanie Röthlisberger
  - Genitive alternation: Benedikt Heller
- Principal investigator: Benedikt Szmrecsanyi
- First results: Szmrecsanyi et al. (2016)

THE “ENGLISH WORLD-WIDE PARADIGM”

- Wide range of postcolonial varieties
- topics: scope, limits, parameters of variation; extent to which structural make-up of varieties of E can be predicted by communicative needs of colonizers/colonized

  (e.g. Kachru 1992; Schneider 2007; Mesthrie and Bhatt 2008)
- shortcoming: an often primarily descriptive interest in the variable presence/absence of features, or in usage frequencies of features

THE PROBABILISTIC GRAMMAR FRAMEWORK

- rely on the variation-centered, usage- and experience-based probabilistic grammar framework developed by Joan Bresnan and collaborators

  (e.g. Bresnan 2007; Bresnan and Ford 2010a; Wolk et al. 2013)

  1. syntactic variation – and change – is **subtle, gradient & probabilistic** rather than categorical in nature

     (Labov 1982; Bresnan and Hay 2008a)
  2. linguistic knowledge includes **knowledge of probabilities**, and speakers have powerful predictive capacities

     (Gahl and Garnsey 2004; Gahl and Yu 2006)

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How similar are syntactic alternation patterns in GloWbE to the patterns in ICE?

DATIVE ALTERNATION

(1) He gives [Mary]$_{\text{recipient}}$ [a present]$_{\text{theme}}$

ditransitive dative

(2) He gives [a present]$_{\text{theme}}$ to [Mary]$_{\text{recipient}}$

prepositional dative

GENITIVE ALTERNATION

(3) [The president]$_{possessor}$'s [speech]$_{possessum}$

***s*-genitive**

(4) The [speech]$_{possessum}$ of [the president]$_{possessor}$

***of*-genitive**

CHOICE CONTEXT

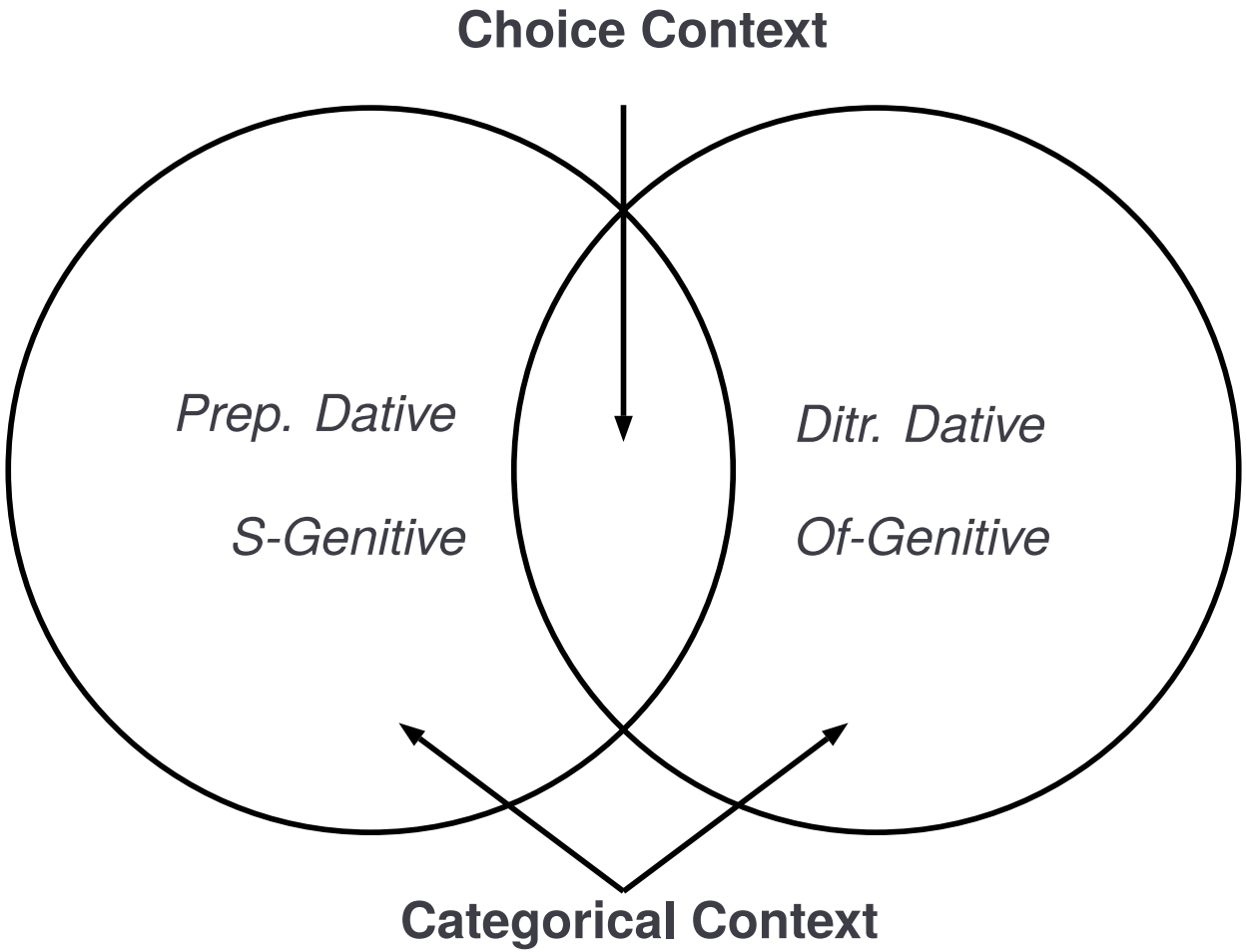

Figure: Adapted from Rosenbach (2002, 28)

DATA

CORPUS DATA


Great Britain
Ireland
Canada
Jamaica
India
Hong Kong
Philippines
Singapore
New Zealand

THE CORPUS FAMILIES

For each alternation

- 10,000 cases from ICE
- 5,000 cases from GloWbE

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ICE

- Greenbaum (1996)
- 1 million words per component
- 60 % spoken, 40 % written
- traditional compilation

GloWbE

- Davies and Fuchs (2015)
- 1.9 billion words in total
- 60 % blogs (informal), 40 % other (more formal)
- large-scale

RETRIEVING DATIVE TOKENS

1. Extracting dative tokens using a verb list
2. Weeding out instances that are not interchangeable, e.g.
    - Fixed and idiomatic expressions (e.g. *bring it to the boil*)
    - Spatial goals (e.g. *send their daughter to school*)
    - Beneficiaries (e.g. *We get them uh typed photo copies*)

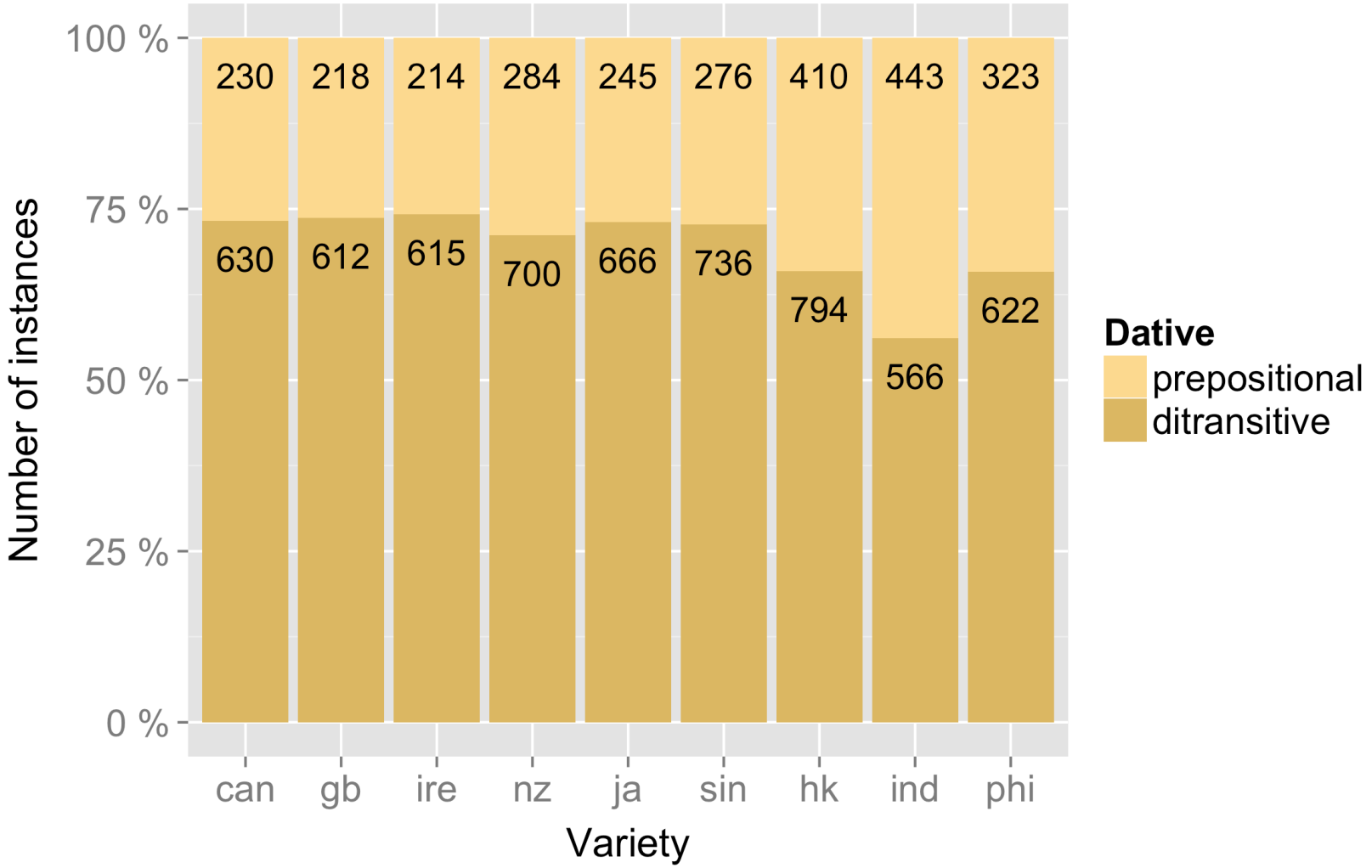
(see Bresnan et al. 2007; Bresnan and Hay 2008b; Bresnan and Ford 2010b; Bernaisch et al. 2014; De Cuypere and Verbeke 2013)

RETRIEVING GENITIVE TOKENS

1. Extract genitive tokens using the markers *'s*, *s'*, and *of*
2. Weeding out instances that are not interchangeable, e.g.
    - Indefinite *of*-constructions (e.g. *a supply of fuel*)
    - Fixed expressions (e.g. *The Bank of England*)
    - Partitive constructions (e.g. *one of my friends*)

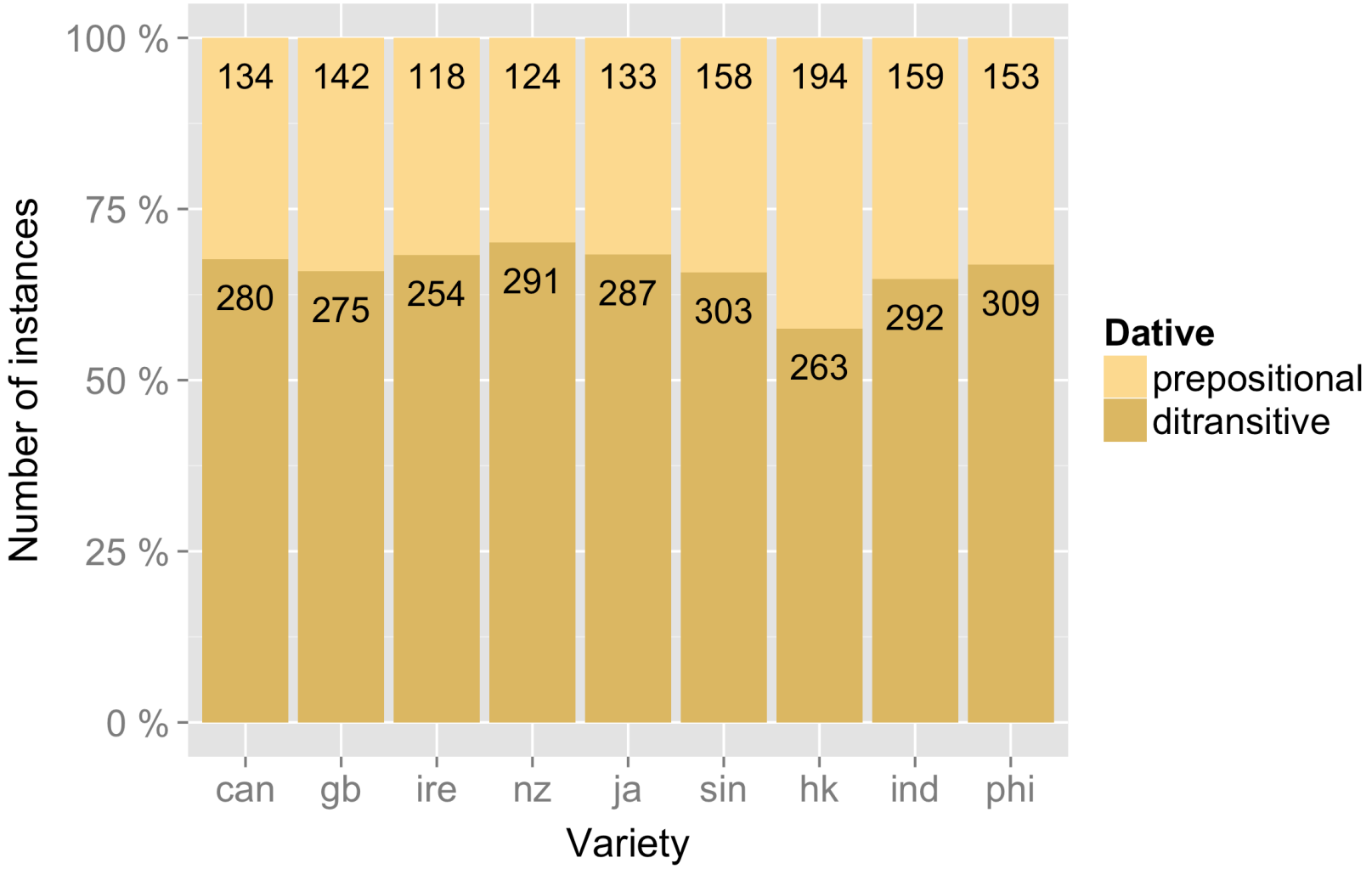
(see, e.g., Rosenbach 2002, 2014)

RAW FREQUENCIES—DATIVES BY VARIETY (ICE)



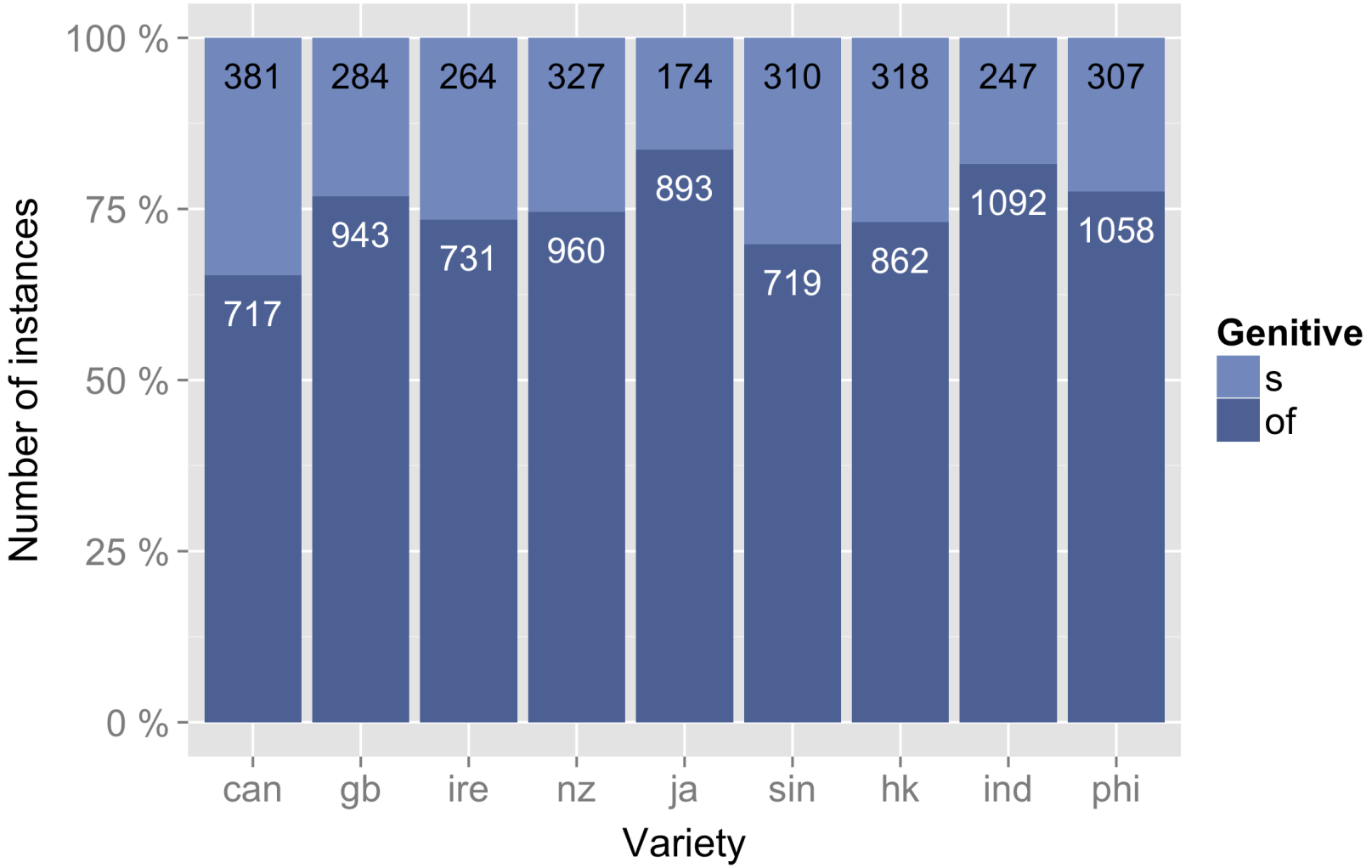
$(n = 8,548)$

RAW FREQUENCIES—DATIVES BY VARIETY (GLOWBE)



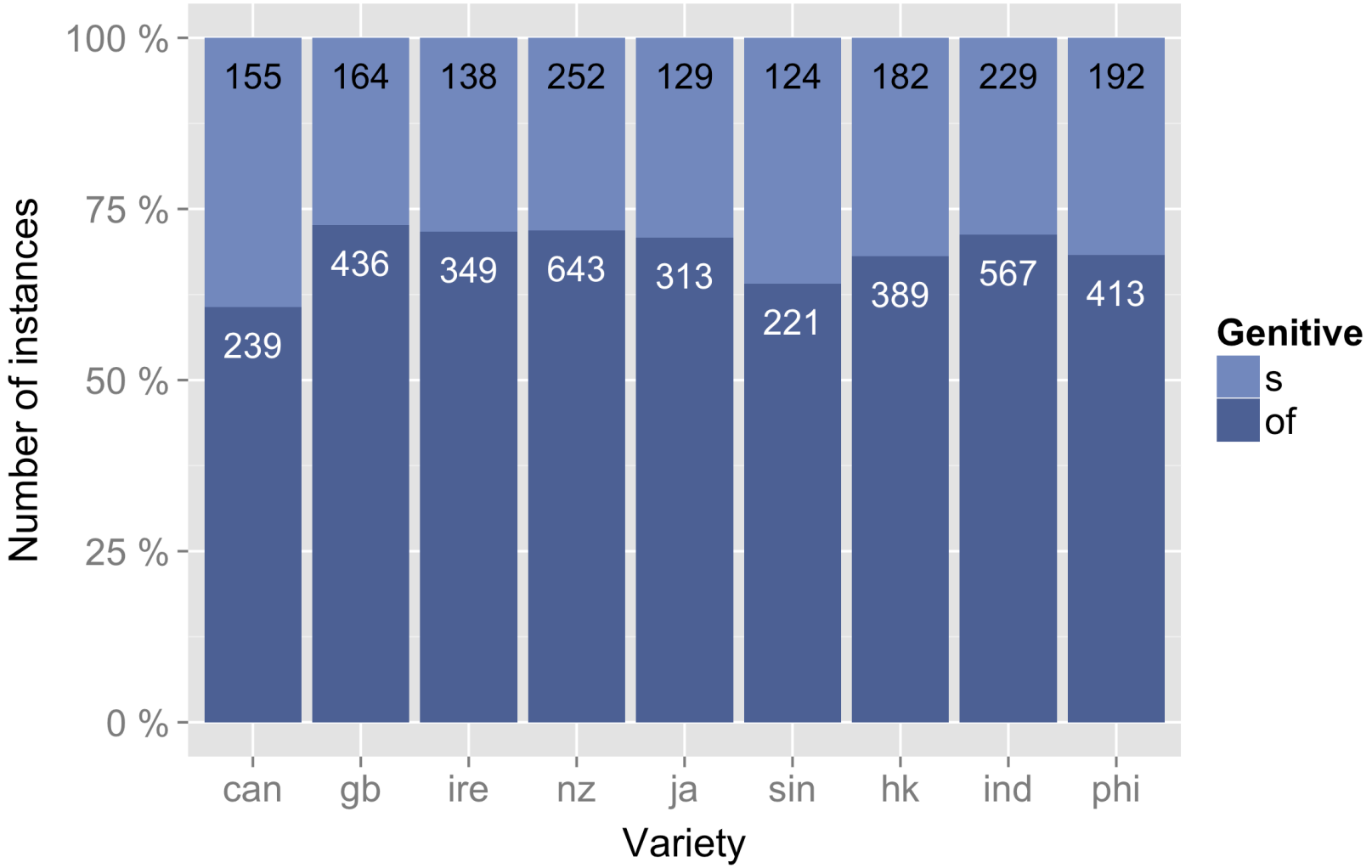
$(n = 3,869)$

RAW FREQUENCIES—GENITIVES BY VARIETY (ICE)



$(n = 10,587)$

RAW FREQUENCIES—GENITIVES BY VARIETY (GLOWBE)



$(n = 5,135)$

RAW FREQUENCIES

- Datives
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  - Ratio of *s*-genitives and *of*-genitives seems more stable
- Both alternations
  - The low-frequency form is comparatively frequent in GloWbE
  - Despite the smaller sample, ratios seem more stable across varieties in GloWbE

METHODOLOGY

COMMON PREDICTORS

- Animacy of the constituents (*inanimate* or *animate*)
  - Datives: recipient and theme
  - Genitives: possessor and possessum
- Syntactic weight measured as Weight Ratio
  - Dative alternation: $WR = \frac{recipient\ \ length}{theme\ \ length}$
  - Genitive alternation: $WR = \frac{possessor\ \ length}{possessum\ \ length}$
- Givenness (*given* or *new*)
  - Dative alternation: recipient and theme
  - Genitive alternation: possessor
- Corpus (*ICE* or *GloWbE*)
- Variety (*gb*, *can*, *nz*, *ire*, *ind*, *hk*, *sin*, *ja* or *phi*)

DATIVE-SPECIFIC PREDICTORS

- Person of recipient (*local* or *non-local*)
- Complexity of recipient and theme (*complex*, i.e. following postmodification, or *simple*)
- Pronominality of recipient and theme (*pron* or *non-pron*)
- Definiteness of recipient and theme (*definite* or *indefinite*)
- Concreteness of theme (*concrete*, i.e. perceivable with senses, or *non-concrete*)

GENITIVE-SPECIFIC PREDICTORS

- Final Sibilancy of the possessor
  (5) The paradox's conclusion <ICE-IND:W2B-021>
  (6) the church's solidarity with women <ICE-NZ:S1B-011>
- Thematiciy of possessor head
- Type-Token Ratio of immediate context
- Overall Frequency of the possessor head

MIXED-EFFECTS LOGISTIC REGRESSION

- Random effects (REs)
  - Predictors that are special to the sample, i.e not repeatable (Baayen, 2008, 241)
  - It is crucial to account for idiosyncrasies of speakers and corpus structure (Gries, 2015)
  - Varying intercepts for speakers and for constituent heads for both alternations
- Model selection according to guidelines in Zuur et al. (2009, ch. 5) and Gries (2015)

RESULTS

DATIVES IN GLOWBE & ICE

Main effects

Fixed effects	Estimate	Odds Ratio	p-value	
THEME_COMPLEXITYsimple	-0.63	0.53	<6.29e-07	***
REC_DEFINITENESSdef	0.52	1.68	5.60e-06	***
REC_COMPLEXITYsimple	0.95	2.59	8.06e-09	***
REC_GIVENNESSgiven	0.24	1.27	<0.02	*
REC_ANIMACYanimate	0.80	2.23	7.54e-12	***
THEME_DEFINITENESSdef	-0.70	0.50	7.36e-12	***
zTHEME_THEMATICITY	-0.34	0.71	0.0003	***
REC_PERSONlocal	1.51	4.53	0.0004	***
THEME_PRONpron	-1.35	0.26	0.0024	**
REC_PRONpron	0.91	2.48	0.024	*
WEIGHT_RATIO	-3.37	0.03	1.33e-14	***
VARIETYhk	-0.67	0.51	0.036	*
VARIETYind	-2.61	0.07	5.88e-15	***
VARIETYphi	-0.95	0.39	0.0075	**

DATIVES IN GLOWBE & ICE

Interactions

Interactions	Estimate	Odds Ratio	p-value	
CORPUSglowbe:VARind	1.21	3.35	0.0015	**
REC_PRONpron:VARcan	0.99	2.69	0.0334	*
REC_PRONpron:VARind	1.32	3.74	0.0026	**
THEME_CONCRconcrete:VARind	0.94	2.56	0.0408	*
WEIGHT_RATIO:VARind	1.26	3.53	0.0245	*

- Adding 'corpus' as an interaction term with all other predictors in this table doesn't add anything to the model.
- Accuracy: 93.5 %; C-Value: 0.98

GENITIVES IN GLOWBE & ICE

Main effects

Fixed Effect	Estimate	Odds Ratio	p-value	
POR_ANIMACYa	3.454	31.627	0.000	***
PUM_ANIMACYa	0.231	1.260	0.042	*
WR_LOG	-1.48	0.228	0.000	***
FINAL_SIBILANCY_PORtrue	-1.135	0.321	0.000	***
POR_GIVENNESSgiven	0.182	1.200	0.021	*
POR_HEAD_FREQ_LOG	-0.137	0.872	0.000	***
POR_THEMATICITY_LOG	0.22	1.246	0.000	***
TTR	2.482	11.965	0.000	***
CORPUSGloWbE	0.288	1.334	0.014	*
VARIETYcan	0.786	2.195	0.009	**
VARIETYire	0.433	1.542	0.164	*
VARIETYnz	0.593	1.809	0.043	*
VARIETYsin	0.67	1.954	0.023	*

GENITIVES IN GLOWBE & ICE

Interactions

Fixed Effects	Estimate	Odds R.	p-value	
POR_ANIMACYa:VARIETYphi	-1.158	0.314	0	***
POR_FREQ:CORPUSGloWbE	0.074	1.077	0.008	**
WR_LOG:VARIETYind	0.445	1.560	0.013	*
WR_LOG:CORPUSGloWbE	-0.215	0.807	0.015	*
FINAL_SIBILANCYtrue:VARIETYcan	-0.871	0.419	0.026	*
POR_ANIMACYa:VARIETYind	-0.638	0.528	0.041	*

- Accuracy: 91.9 %; C-Value: 0.97

REGRESSION SUMMARY

Significant main effects

	ICE	GloWbE	ICE & GloWbE
Datives	12	11	14
Genitives	10	6	12

Significant interactions with VARIETY

	ICE	GloWbE	ICE & GloWbE
Datives	3	0	4
Genitives	6	1	4

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  - Frequent possessor heads less averse to *s*-genitive in GloWbE.
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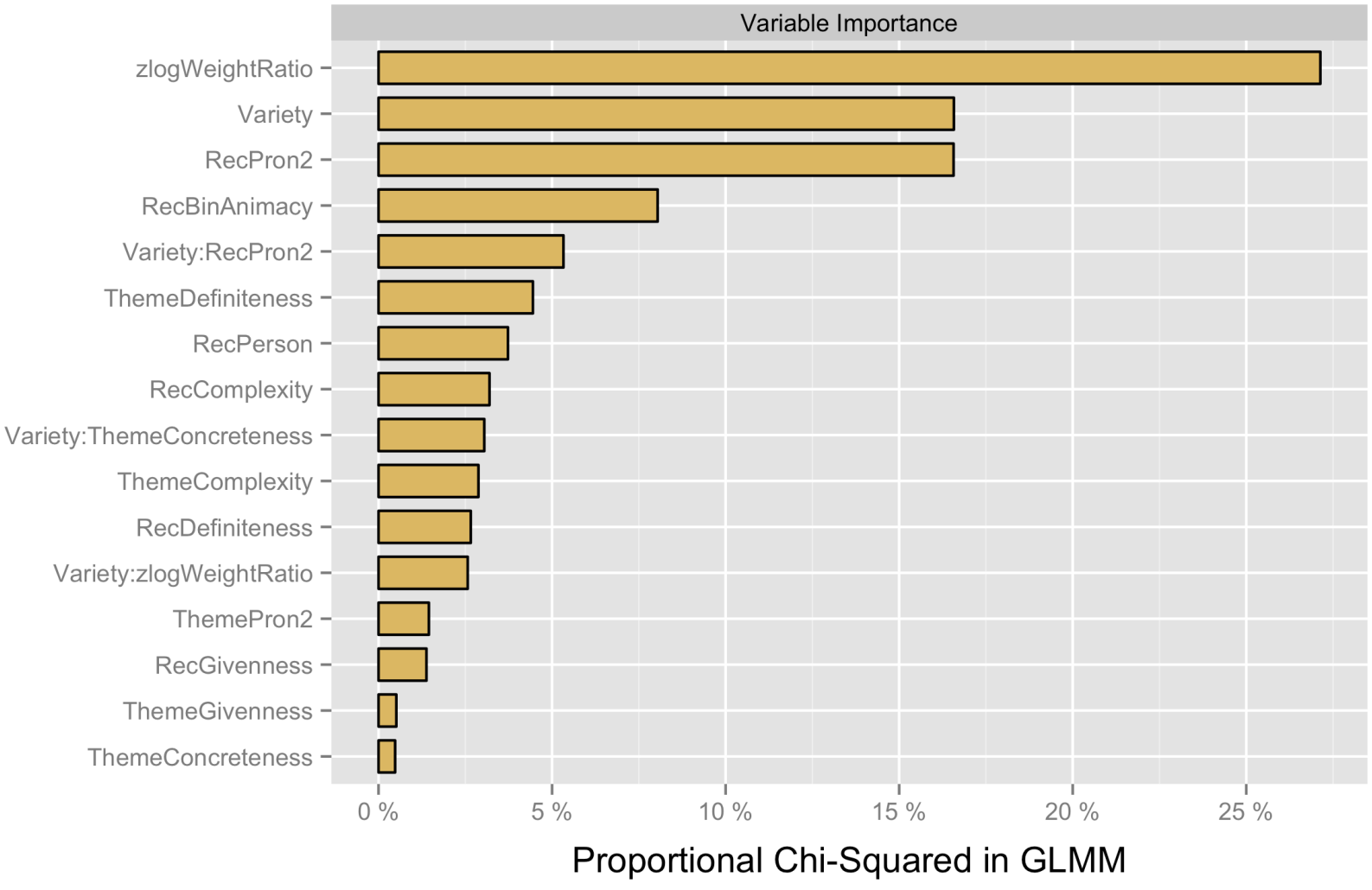
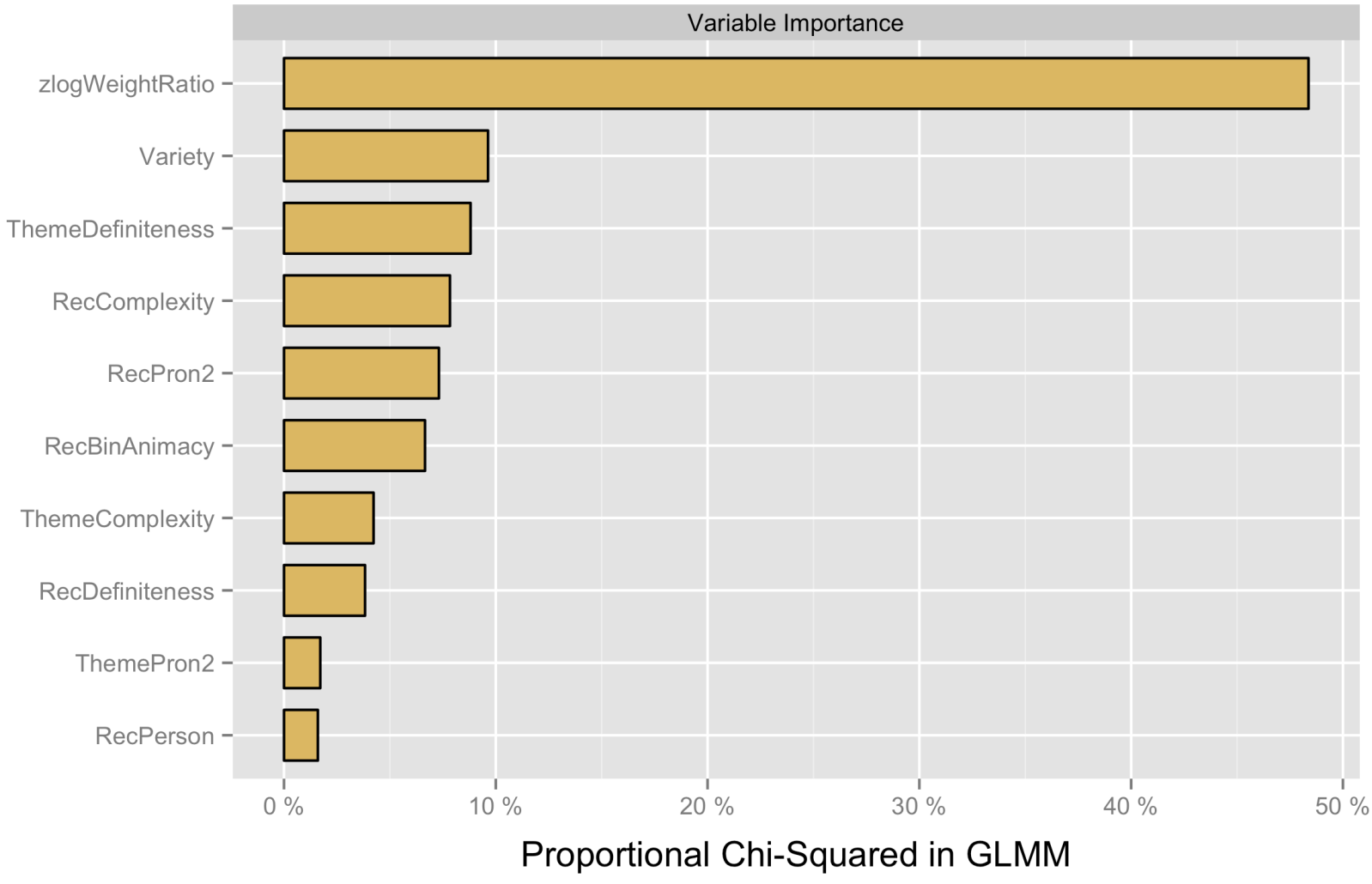
- Both alternations
  - No surprises (e.g. change of direction of an effect) when comparing the ICE and the GloWbE models.
  - No additional interactions between Corpus and any other predictor in both models.

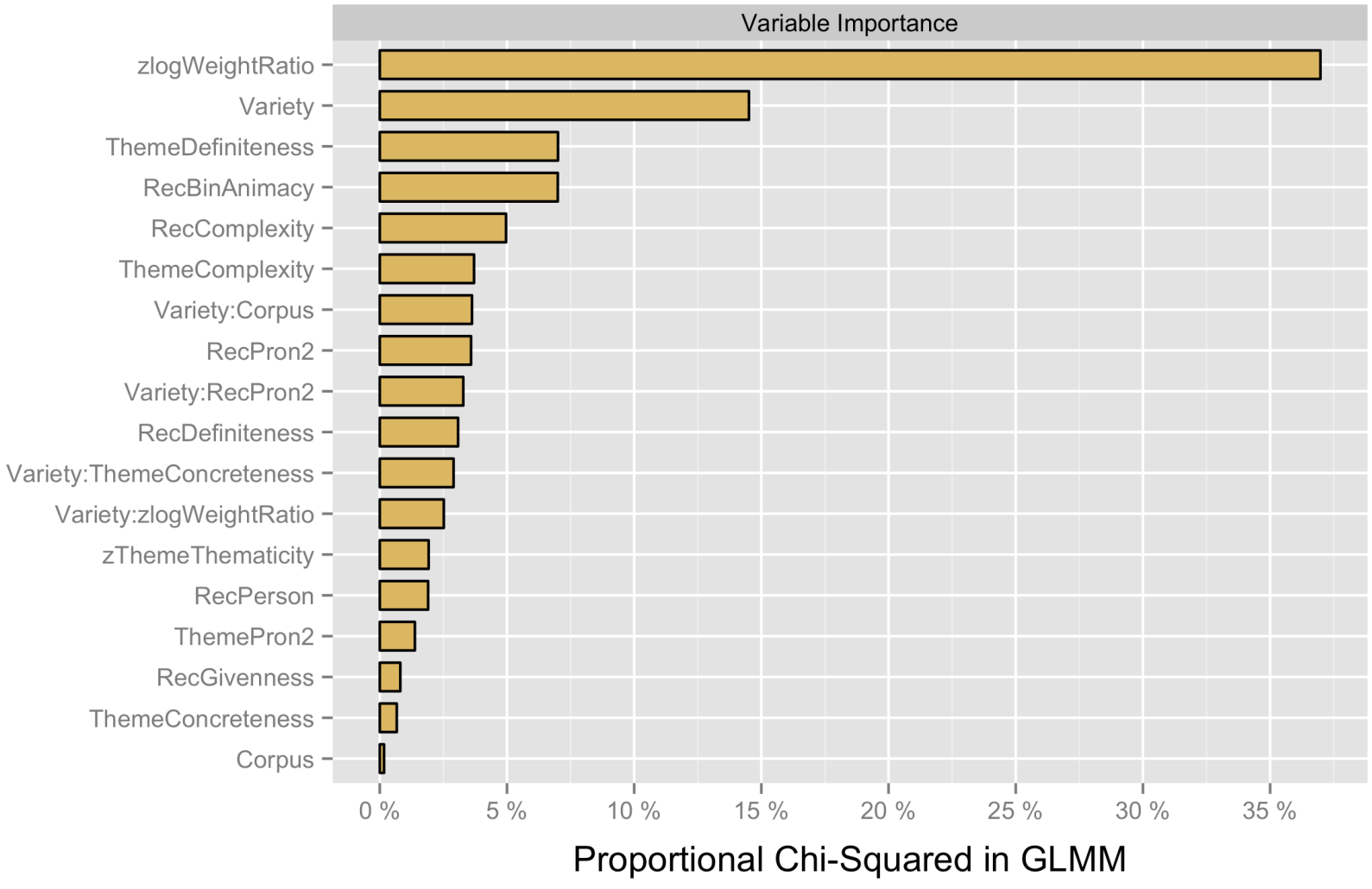
VARIABLE IMPORTANCE (ICE): DATIVES



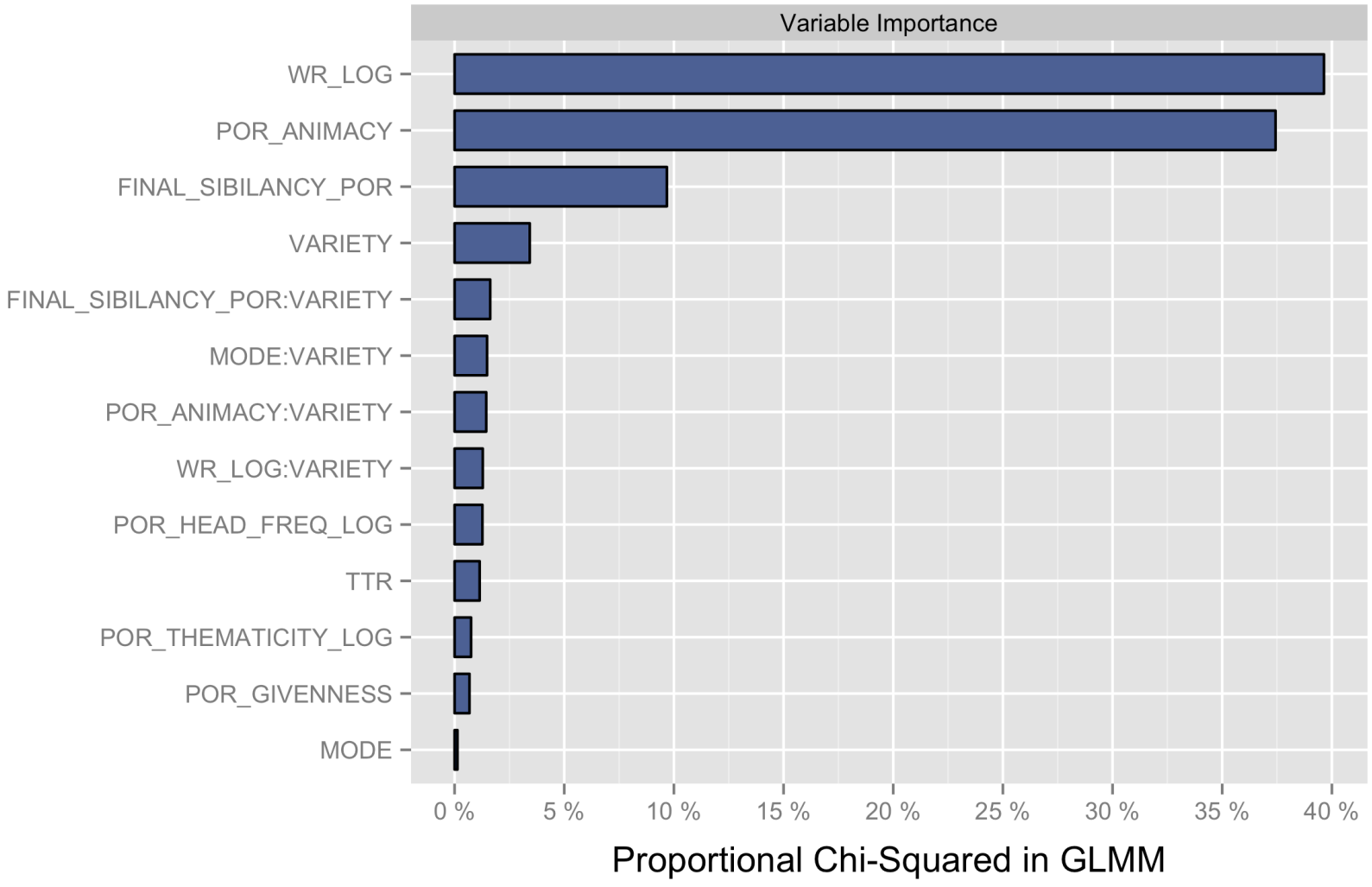
VARIABLE IMPORTANCE (GLOWBE): DATIVES



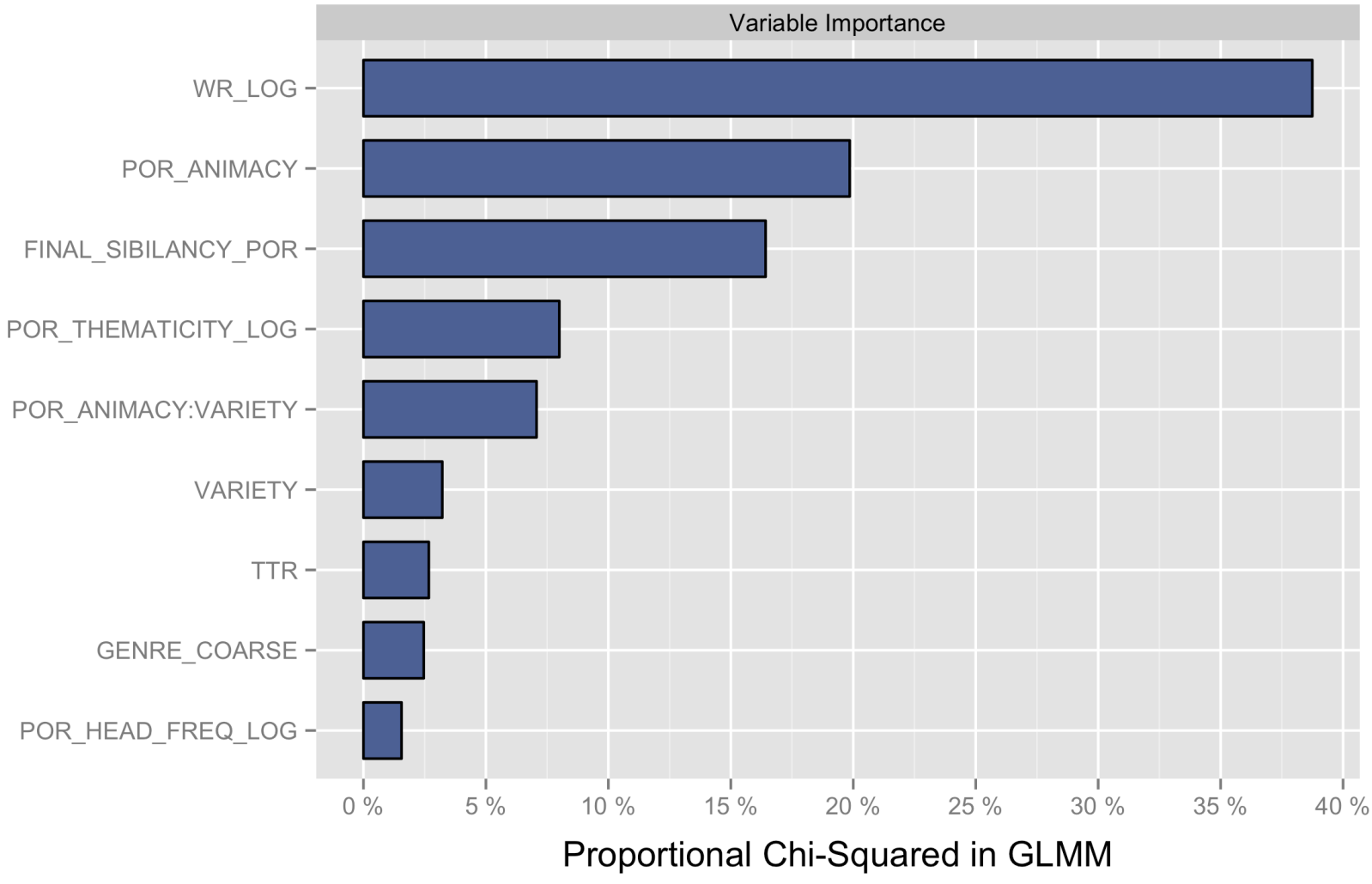
VARIABLE IMPORTANCE (FULL DATASET): DATIVES



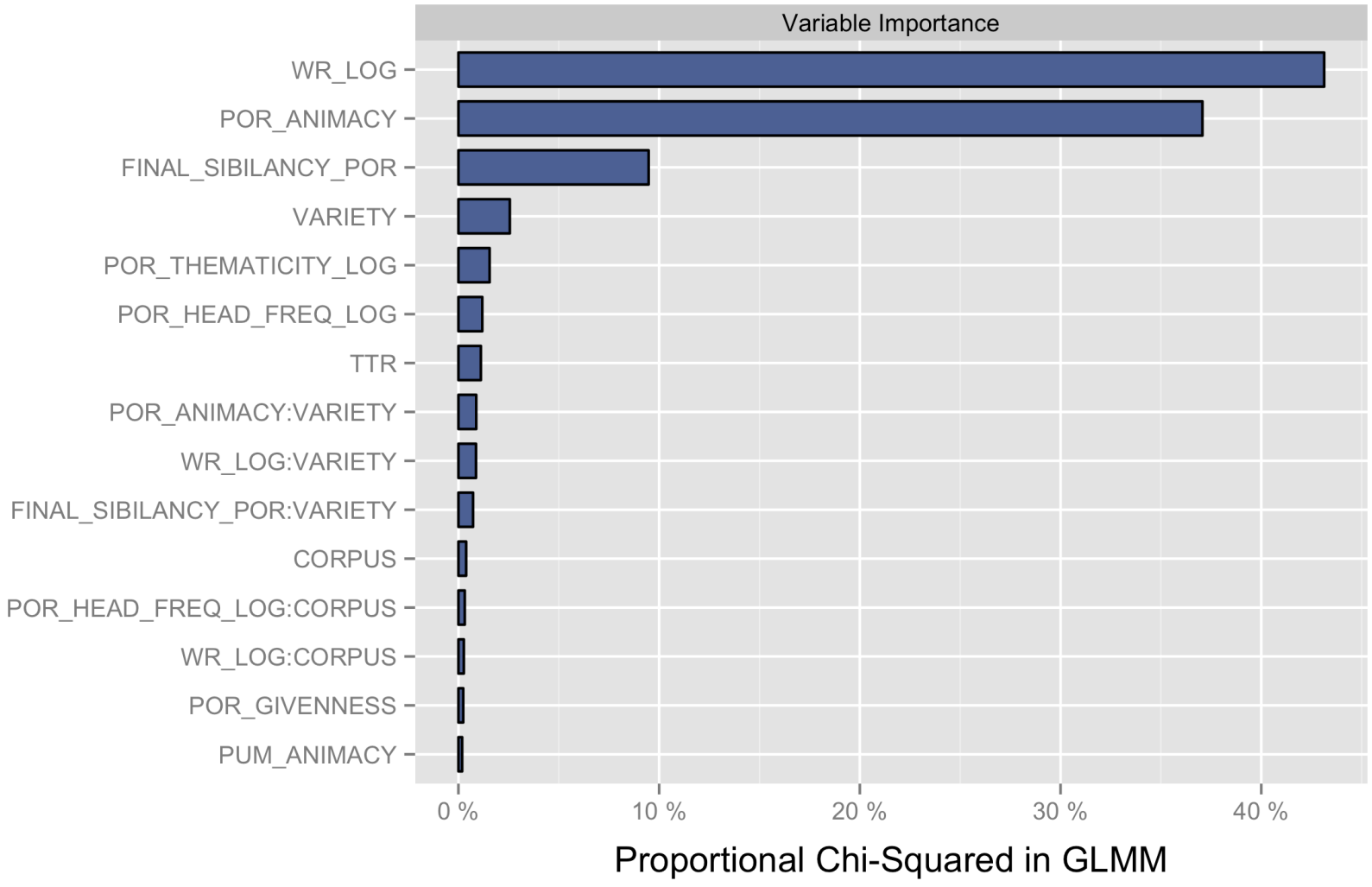
VARIABLE IMPORTANCE (ICE): GENITIVES



VARIABLE IMPORTANCE (GLOWBE): GENITIVES



VARIABLE IMPORTANCE (FULL DATASET): GENITIVES



VARIABLE IMPORTANCE

Summary

- Datives
  - Variety lost importance slightly.
  - Recipient Pronominality (rank 2 in ICE) becomes less important (rank 8).
  - Theme Definiteness becomes more important (rank 6 to 3).
- Genitives
  - No changes.

SUMMARY & CONCLUSION

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- Discovering cross-varietal differences in the mechanisms of the dative and the genitive alternation requires a lot of richly-annotated data.
- The supplementation of data form GloWbE turned out to be beneficial for our research purposes
- There is an amazing similarity between ICE and GloWbE in the patterning of the alternations: CORPUS does not really matter
  - We discovered more significant effects in the full models.
  - Just one CORPUS-VARIETY interaction in the dative model; none in the genitive model.
  - Just slight differences in variable importance for the datives; no differences for the genitives.

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